

STAMPING OUT TYPHOID

BY EDWIN F. BOWERS, M.D.

TYPHOID fever is no longer to be dreaded. Stagnant wells and the germ-infested, moss-covered bucket need possess no further terror for the summer vacationist. The succulent oyster, the insufficiently washed salad, and the contaminated raw fruit have been shorn of their power for evil. Even with the typhoid fly (and all flies are potentially typhoid flies) still wiping his feet on the food, and the polluted water supply the same corrupt fluid as of yore, typhoid is becoming less formidable. Gradually it is losing its grim place as the cause of one-fifth of the world's mortality.

Typhoid germs are at last on the defensive; for we have found that boiling improves them. It enhances their value to such an extent that when injected into the human system they render the premises untenable to their fellows. Within a few years, if the public can be educated to appreciate the utility of preventive inoculation against typhoid, this epidemic disease will be as rare as typhus, plague, or cholera.

When we consider that three hundred and fifty thousand suffer from typhoid every year in the United States, and that thirty-five thousand die, also that it leaves other thousands permanently injured from damage to heart, liver, kidneys, gall bladder, and nervous system, the enormous significance of its prevention can be better understood.

And, strangely enough, all our knowledge of the subject has been gained through observation upon soldiers,—by attempting to keep fighting men alive until they could be killed by the legitimate method of civilized warfare. Now, a soldier is efficient only so long as he is healthy. When he becomes ill, he decreases the fighting force, not only through his own incapacity, but because he requires the services of others, who potentially might be fighters, to care for him. Of course the business of a soldier is to fight and be killed, possibly; but it isn't his business to be killed before he has a chance to fight. And typhoid kills more soldiers than all the war machinery combined.

Because of this, Major Russell, M. D., U. S. A., after seeing the result of preventive typhoid inoculation in foreign armies, introduced it among our troops. As a consequence, within the last five years the typhoid rate has fallen to less than one-tenth. In 1912 there were only fifteen cases among fifty-seven thousand troops. More striking still, among the twelve thousand six hundred and forty-four vaccinated men on the Mexican border only one case of typhoid developed, and no deaths; while in the neighboring city of Galveston the disease was rife. During the same period there occurred in the remainder of the army four hundred and eighteen cases, with thirty-two deaths. The rate to the thousand among the vaccinated was .39, while among the unvaccinated it was almost ten times as high.

Compare these results with the grisly records of the Spanish War, when, among ten thousand five hundred unvaccinated troops at Jacksonville, Florida, who secured their water from a much purer source than the Texas troops,—viz., from artesian wells,—there were twenty-nine hundred and ninety cases of typhoid and two hundred and forty-eight deaths!

THIS conquest of typhoid may well be considered one of the most brilliant achievements in the annals of medical progress, and it has come about within the memory of mere youths. Like so many other great medical discoveries, it bears the stamp of "Made in Germany"; at least the painstaking Germans gave it its initial impulse.

In 1887 four physicians of the Kaiser's realm—Frankel and Simmonds, Bauer and Pieper—demonstrated that by injecting small doses of virulent, living typhoid germs into animals resistance to the fever was increased. Frankel and Simmonds repeatedly injected small nontoxic doses into rabbits, then treated the rodents to a quantity that would ordinarily have induced a fatal attack, but caused only temporary discomfort. Bauer and Pieper performed a like kind of tests for a number of mice, with similar results.



This form of immunization with active, nonweakened organisms was of course too dangerous to be extended to man. But about the same time Professor Chantemesse, of the Academy of Medicine in Paris, and Dr. Widal, originator of the famous "Widal reaction," conceived the idea of sterilizing the germs by subjecting them, in a water bath, to a temperature of one hundred and twenty-eight to one hundred and forty degrees Fahrenheit. The bugs have little or none of the salamander characteristics,—one point in our favor,—and they succumbed to heat very readily.

Three or four injections of this sterile solution conferred immunity against typhoid fever among animals, and thus it was perfectly safe to use on the human animal.

So, in 1896, Pfeiffer and Kolle immunized two men with the vaccine, and investigated the changes in the blood with characteristic German thoroughness.

A FEW weeks later Sir A. E. Wright, of the medical corps of the British army, began a series of studies on typhoid immunity by inoculation with killed germs, and the following year published the results of his experiences with eighteen cases, which results were so conclusive and practical that the process was thought worthy of adoption in the army.

And so it was that prophylactic, or preventive, inoculation was introduced into the British army in India, and Tommy Atkins reaped considerable benefit thereby. Wright used cultures in broth which had been incubated for three weeks, and then killed by heating to one hundred and forty degrees Fahrenheit for an hour. The size of the dose was determined by animal experimentation; the quantity necessary to kill a small guinea pig being used as the immunizing dose for a man. Each lot was "standardized" in this manner.

When typhoid became epidemic during the Boer War, Wright had a chance to try out the treatment on a large scale: a gigantic scale, for the army developed thirty-one thousand cases of typhoid, with almost six thousand deaths. This tremendous loss of efficiently drilled soldiers was a serious handicap to the English. They might have crushed the burghers and taken their territory from them much sooner, had not the fifth plague ravaged their ranks so numerically.

So, while the effects on the whole were promising, the net results were rather unsatisfactory. Also the reaction was very severe; and while young and vigorous soldiers might be able to recover from it in a short time, the treatment would not have made much of a hit with civilians. Dr. Wright, however, claimed that the incidence of the disease was diminished one-half, and the mortality even more.

But those thirty-one thousand cases in his army stood out like a shining carbuncle on the back of John Bull's neck. He had always been a skeptic,—is yet, as the suffragists will gladly testify. Probably he never calmed his nerves for a number of mice, with similar results.

culated how much worse off the army might have been had it received no treatment at all. However, the practice of inoculation was officially discontinued after England "steam-rolled" the recalcitrant Boers.

Then Sir William B. Leishman, associated with Dr. Wright in the Royal Army Medical Corps, by a series of brilliant experiments demonstrated

that the defects in the preventive treatment were caused by overheating the solution in the laboratory. This produced destructive changes in the "end" products (the germ toxins) upon which depended the stimulating powers of the vaccine (that element which creates increased interest, appetite, and appreciation among the body cells). So Professor Leishman perfected the technic or preparation of the "soup," and now there is no difficulty in securing uniformly good and efficient vaccine.

Following the Boer War the next extensive use of antityphoid vaccine was in the German Colonial Army, when, from 1901 to 1907, the Germans chased the Hereros over a considerable part of the landscape of Southwest Africa. As is customary

among the Germans, they lugged the famous old "Ark of the Covenant" (*es ist verboten*) around with them; and, although the interdiction not to do this, that, or the other thing obtruded itself like Banquo's ghost, and would not down, the typhoid rate went up.

They totaled two hundred and twenty-six cases in 1904. Then Professor Robert Koch, one of the ablest scientists that ever lived, advised preventive inoculations. The typhoid rate immediately dropped, and in 1907—the year before grim-visaged War gave up his job in German Africa, and put in his spare time expertly to the pleasures of a lute—the number of cases reported was forty-three.

Then in Asia, Africa, India, and other English possessions, in Japan, and finally in the United States, many hundreds of thousands of men underwent injection. They proved themselves infinitely less susceptible to typhoid than similar numbers of men who were exposed to identical conditions but refused to avail themselves of the protection afforded by the vaccine. These latter deemed it dangerous, as some hold vaccination for smallpox to be. Typhoid inoculation propagandists have found it difficult to overcome prejudice for this reason; but this prejudice is entirely unfounded.

Accidents rarely follow the injection of dead germs and their products. This constitutes an entirely different procedure from introducing living smallpox organisms of unknown potentiality into the system, there possibly to create such havoc and destruction among the white corpuscles that the ranks of these little defenders are weakened, and their courage reduced to the lowest ebb. But with typhoid inoculation there are absolutely no such dangers.

THE immunity conferred by inoculation is supposed to last about a year. The reaction from the injection is usually very slight. The treatment is divided into three injections,—the first, a dose of five hundred million bacteria in one cubic centimeter (about a tea-spoonful) of normal salt solution (teaspoonful of salt to the pint). This is given about four in the afternoon, because the reaction, if it be apparent at all, comes on about bedtime, and is practically over by morning. Occasionally nausea, vomiting, headache, prostration, and some elevation in temperature develop; but these are the rare exceptions. Generally there is a little local pain at the site of the injection, a slight headache, and a feeling of drowsiness; also a red, tender area develops several hours later around the point of inoculation. But by next morning the subject is usually all right, both as to appetite and to general well-being.

The men are cautioned not to drink alcoholic liquors when undergoing treatment, as this precipitates every painful and discomforting symptom that the combination of the two bags can conjure up. The second and third doses are twice the size of the first,—one thousand

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